

# PERIORBITAL REJUVENATION SURGERY IN THE GERIATRIC POPULATION

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## SUMMARY

Periorbital aging is an unavoidable, progressive process that is often accompanied by visual obscurations and ocular discomfort. With surgical correction, patients may benefit not only functionally but also psychosocially when an aesthetic outcome is obtained. The periorbital anatomical structures in elderly patients are complex and interlocking, requiring a thorough evaluation and systematic approach. Most elderly patients are reluctant to undergo procedures that require prolonged surgical and recovery times if they think it is only for cosmetic improvement. We review contemporary periorbital surgical methods suitable for a geriatric population, namely procedures that are low-cost, low-risk, with short operative and recovery times, and that have excellent patient acceptability. It is feasible to select procedures that can be customized to the needs of the elderly. [International Journal of Gerontology 2010; 4(3): 107–114]

**Key Words:** blepharoplasty, blepharoptosis, elderly, fat repositioning with midface lift

## Introduction

Periorbital aging is a relentless and unavoidable process that inevitably progresses over time. The elderly are commonly subject to both the cosmetic and functional effects of aging around the eyes. While this condition does not impose imminent physical danger, it may have various psychosocial and functional effects. The eyes are a person's most noticeable feature. Knoll and colleagues<sup>1</sup> found that one's appearance alters the way others perceive that individual's mood. Common impressions associated with periorbital aging are that the person looks tired, sad, disgusted, or angry. However, beyond simply affecting appearance, severe laxness of tissue around the eyes may actually obscure vision and

cause ocular discomfort. These are the main reasons patients request periorbital surgery. They can be encouraged to expect functional, cosmetic and psychosocial benefit from the procedure.

Displacement and redundancy of the periorbital structures in elderly patients are more complex and interrelated than in younger people. When a periorbital aesthetic procedure in an old person is considered, all anatomic components contributing to the region must be evaluated. A thorough understanding of the pertinent anatomy is a prerequisite for designing the surgical approach and determining the outcome. It is especially important to choose techniques suited to the target population. Most elderly patients are not interested in a complicated surgical procedure for periocular rejuvenation, particularly if it is painful and requires a prolonged recovery. We reviewed contemporary periorbital surgical methods to identify procedures that are low-cost, low-risk, have short operative and recovery times, and are well accepted by patients. With a combination of the methods we currently use, it is possible to select procedures that can be customized to the needs



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of the elderly. Our discussion will specifically target the Asian geriatric population, mostly of Chinese descent, who comprise the majority of our patients.

## Signs of Periorbital Aging

The signs of periorbital aging include upper and lower lid deformities. The upper lid abnormalities include dermatochalasis, eyelid ptosis (or blepharoptosis), brow ptosis, and upper lid skin hooding. The lower lid counterparts consist of eyelid bag formation, tear-trough deformity, entropion, and ectropion.

Dermatochalasis is defined as laxity of the skin. Eyelid ptosis in the elderly results from dehiscence of the levator aponeurosis from its original tarsal insertion or from fatty degeneration of the levator muscle. Brow ptosis is usually a sign of detachment of the footing of the eyebrow from the underlying periosteum. Upper lid skin hooding refers to heavy sagging of the eyebrow and displacement of the eyelid margin, giving a hooded appearance to the eye, especially the outer half to outer third. The severity of upper lid hooding is mostly determined by the degree of dermatochalasis and brow ptosis, while the presence of upper lid ptosis may further aggravate it.

Lower lid bag and tear-trough deformity are present in all older people to varying degrees. Gravity, exertion (as in heavy lifting), and medical conditions (such as allergies and diseases of kidney, heart, liver and thyroid) facilitate its development<sup>2,3</sup>. Lower lid entropion and ectropion are less common, but they are more likely to cause actual discomfort.

## Pertinent Anatomical Considerations

Focusing on any single problem in the periorbital region is not sufficient when treating the elderly. The position of the eyebrow must be assessed. Otherwise, surgery on the upper lid may result in the eyebrow being pulled down, leaving an inadequate brow-to-lid distance, which gives a sad appearance. Removing only redundant fat tissue from a lower lid fat bag while disregarding the presence of a tear-trough deformity and midface drooping may yield a hollow orbital appearance, resulting in a senile and wasted look. Considering the entire periorbital anatomy is thus essential for designing an appropriate procedure.

Gravity plays an important role in the aging process, pulling everything in the face downward, albeit at different rates. Loosened structures with minimal underlying attachments such as the areolar layer of the scalp, fat pads, and the skin are the first to descend. Muscles with varying degrees of contraction, tensile strength, and attachment to the periosteum are affected next. The most long-lasting structures are the ligaments, the skin to which they are attached, and underlying tissues fixed to the periosteum. These tend to hold other structures in compartments, resulting in a lumpy appearance with aging. Given these features of the aging structures, reconstruction must be planned from the top down, putting things back in position in an orderly fashion. It is important to avoid unnecessary or premature procedures that may contribute to subsequent worsening of the appearance.

### ***Eyebrow ptosis***

Aging of the scalp and the underlying muscles is responsible for descent of the eyebrow. The frontalis muscle, originating in the galea aponeurotica and inserting into the skin of the eyebrow and nose, is responsible for elevation of the eyebrow, usually more centrally than temporally. The corrugator supercilii muscle, which originates in the periosteum of the nasal root and inserts into the skin of the medial eyebrow, depresses the medial brow. The areolar layer of the scalp is a loose structure sandwiched between the subcutaneous tissue and galea aponeurotica. With age, the weight of the forehead and periorbital skin and contracture of the corrugators supercilii exert downward forces, causing the forehead skin to glide over the loosened areolar layer. This effect is exacerbated as the counteracting upward force of the frontalis muscle weakens over time. The net downward vector forces result in descent of the eyebrows.

### ***Blepharoptosis***

The first sign of senile blepharoptosis is broadening of the lid crease. The patient usually presents with a sunken eye and a half-asleep appearance due to narrowing of the eyelid fissure. Occasionally, blepharoptosis is severe enough to obscure the superior visual field, forcing the patient to adopt a chin-up posture in order to see clearly<sup>2</sup>. Levator muscle function is usually intact ( $>8\text{ mm}$ )<sup>2</sup>, but the distance from the eyelid margin to the pupillary light reflex decreases and may differ between the two eyes<sup>3</sup>. Ptosis may also result from anterior segment ophthalmologic procedures commonly

performed in the elderly, such as cataract surgery, corneal transplantation, and glaucoma filtering surgery<sup>4</sup>.

### ***Dermatochalasis***

Often, the only problem in the upper lid itself is dermatochalasis. The upper eyelid skin gradually covers the lid margin when the eye is opened naturally. The contour formed by the folded edge of the upper eyelid skin and the lower lid margin resembles a triangle tenting upward. The apex shifts medially with age, signifying greater lateral skin redundancy.

### ***Senile (involutional) entropion and ectropion***

The lower lid consists of anterior (including skin and orbicularis muscle), middle (suborbicularis fibroadipose tissue, orbital septum, and orbital fat), and posterior (tarsal plate, retractors, and conjunctiva) lamellae<sup>5</sup>. The interaction and balance of these three lamellae determine the position of the eyelid margin. The lower eyelid retractors in the posterior lamellae comprise anterior and posterior layers. The posterior layer includes the posterior thick portion of the capsulopalpebral fascia that originates from the inferior rectus muscle fascia and the smooth muscle fibers that arise near the region of the inferior conjunctival fornix. The two parts travel forward jointly to attach onto the lower tarsal plate and exert an inferoposterior force on the lower lid<sup>5,6</sup>. The anterior layer consists of the anterior thin portion of the fascia, a fibrous extension of Lockwood ligament that joins the orbital septum at the upper end of orbital fat<sup>5</sup>. The anatomy at and distal to this junction varies by race<sup>7,8</sup>. In Asians, the subcutaneous attachment of anterior fascia layer that exerts outward and downward forces is underdeveloped, while the orbital fat that exerts upward and inward counter forces extends higher<sup>7,8</sup>. The unimpeded anterior projection of the high-riding orbital fat against the aged, shrunken tarsal plates is held responsible for the higher prevalence of entropion in the Asian geriatric population<sup>8–10</sup>.

This mechanism also helps explain why senile ectropion is less common than entropion among Asians<sup>11,12</sup>. Outward and downward forces generated by a larger-than-average tarsal plate, horizontal lid laxity, and lower lid retractor dysfunction contribute to the development of senile ectropion<sup>10,12</sup>.

### ***Lower lid bag formation and tear-trough deformity***

The preseptal orbicularis oculi muscles form a quasi-circular structure around the eye arising from the

lacrimal sac and the anterior limb of the lateral canthal ligament. The underlying orbital septum originates from the arcus marginalis and inserts onto the levator aponeurosis and lower eye retractors<sup>5,13,14</sup>. Three ligaments, the medial orbital, orbitomalar, and lateral orbital, are firm attachments between the skin and the lower orbital wall. These structures are responsible for the appearance of the tear-trough groove and other demarcations at the orbital rim<sup>15</sup>. The lower orbital fat pads are contiguous with intraorbital fat. Descent of the globe compresses the space between the eyeball and the orbital floor and results in fat herniation through the weakened preseptal orbicularis muscles and orbital septum<sup>16</sup>.

### ***Cheek deformity***

Beyond the arcus marginalis, the presence of two cheek fat pads, namely suborbicularis oculi and malar fat pads, normally contribute to a youthful appearance. In old age, these two fat pads descend from their original position at the lid-cheek junction.

## **Surgical Considerations**

### ***Upper eyelid procedures***

Endoscopic face-lift is considered one of the foremost advances in the field of cosmetic surgery and has become increasingly popular for elective cosmetic surgery in middle-aged individuals<sup>17</sup>. However, it is not ideal for the elderly for several reasons. It is still quite expensive, and using endoscopic techniques to address the extensive tissue problems encountered in this age group would require quite long operative times. We have therefore focused our review on open procedures that continue to yield excellent functional and aesthetic outcomes at a relatively low cost and that most elderly patients can tolerate.

### ***Brow ptosis***

Direct brow lift remains the simplest and most affordable procedure for elderly patients with brow ptosis. The wound, sitting directly above the brow, blends into a face with redundant forehead skin and deep trans-forehead rhytides. The procedure is straightforward, and the extent of excision required is easy to judge<sup>18</sup>. Good immediate results are obtained with minimal bleeding. The patient recovers within days.

### *Surgical procedures*

Local anesthesia is obtained by injection of 2% lidocaine with 1:150,000 U of epinephrine solution. A crescent-shaped wound is created over the upper margin of the eye brow and the incision is directed vertically into the skin toward the periosteum. The skin and the subcutaneous tissues are removed en block and the supraorbital orbicularis muscles are left in place at the base of the wound. After hemostasis was done, the subcutaneous tissues are approximated with 5-0 absorbable sutures and the skin closed with interrupted 6-0 nylon sutures. The skin sutures are removed 7–10 days postoperatively depending on wound healing.

### *Blepharoptosis*

The numerous procedures for correcting involutional blepharoptosis can be categorized into two groups, posterior repair with Muller's muscle resection and anterior repair involving levator aponeurotic advancement<sup>2</sup>. The choice depends on whether excess skin should be removed at the time of the surgery. A small incision (6–12 mm) and posterior approach are excellent for individuals with minimal excess skin, although this is rarely the case for elderly patients<sup>19–22</sup>. Two procedures are generally more suitable for the elderly, a modified Putterman procedure for those with minimal excess skin and the traditional levator resection technique for those with redundant skin<sup>23</sup>.

### *Modified Putterman procedure*

The Putterman procedure (Müller's muscle-conjunctival resection) is a method of correcting blepharoptosis by resecting only Muller's muscle and the conjunctiva, leaving the tarsus and levator aponeurosis intact. By resecting 8.25 mm of the Muller-conjunctiva complex, the endpoint will be at the same height of the upper eyelid as that after topical phenylephrine is instilled (increasing the distance between the inferior margin of the upper eyelid to pupillary light reflex by an average of 1.6 mm)<sup>24,25</sup>.

Perry et al.<sup>21</sup> modified the procedure by incorporating tarsal excision. The extent of excision is matched millimeter by millimeter in additional elevation of the lid, which yields better postoperative symmetry<sup>21</sup>. We used this modification of the Putterman procedure in patients who have minimal redundant skin, a high original lid crease, and good levator muscle function. The benefit of this technique over traditional levator



Figure 1. (A) Preoperative photograph of a 57-year-old patient before bilateral modified Putterman procedure. Note the asymmetry of lid position with the left upper lid more affected. (B) Postoperative photograph showing that symmetry was achieved.

muscle resection is that it takes a short time (an average of 10–15 minutes) to complete while providing a predictable and adequate cosmetic outcome. If a patient develops recurrent blepharoptosis after an initial levator muscle resection, this procedure provides an excellent alternative (Figure 1).

**Surgical Procedure.** Local anesthesia is injected at the superior fornix and the skin through which sutures will be passed. The upper eyelid is everted, and teeth forceps are used to pull on the conjunctiva while three 4-0 silk traction sutures are placed centrally, medially and temporally through the conjunctiva and Muller's muscle. With all three traction sutures pulled simultaneously toward the lower lid, a Putterman ptosis clamp is applied to the tarsal plate. The distances from the lid margin to the central and the lateral borders of the clamp range from 4.5 to 6 mm. The medial distance should be about 1–1.5 mm less in order to avoid postoperative medial ptosis. A 6-0 prolene suture is passed through the skin, exiting the medial end of the tarsus over the clamp. The suture is weaved 4–6 times through the tarsus right above the clamp toward the lateral end of the tarsal plate to the point at which the suture exits the skin and is cut with enough length to make ties. The same suture is re-introduced into the skin 1 mm from the previous exit site and is weaved medially through the tarsus in the same fashion, exiting the skin at the end. The ends are tied together, and the clamped tarsal tissues are cut free along the border of the clamp (Figure 2).



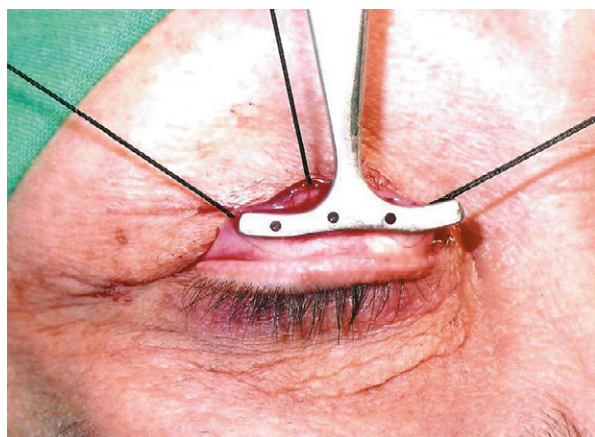


Figure 2. Putterman clamp. The patient is viewed upside down. The distance from the lid margin to the central and the lateral borders of the clamp is the same at 4.5 mm. The medial distance is about 1 mm less in order to avoid postoperative medial ptosis.



Figure 3. (A) Preoperative photograph of a 65-year-old male who underwent levator aponeurosis advancement. (B) Postoperative photograph.

#### *Levator aponeurosis advancement*

Levator aponeurosis advancement is the mainstay for correcting senile blepharoptosis combined with redundant upper eyelid skin. The goal is to shorten the levator aponeurosis and reattach it to the tarsal plate (Figure 3).

**Surgical procedures.** An incision is made where the new eyelid crease is desired. The excess skin and underlying orbicularis muscles are removed *en bloc*. The orbital septum is dissected and the fat pads identified. The levator aponeurosis can usually be located by its shiny, elastic texture although in some patients the structure is not as evident due to senile degeneration. The new insertion site is prepared by dissecting the plane between the orbicularis muscle and tarsal plate



Figure 4. (A) Preoperative appearance of a 61-year-old male who underwent upper lid blepharoplasty. (B) Postoperative appearance.

until the entire upper one-third to one-half of the tarsal plate is exposed. The distal end of the aponeurosis is isolated, clamped, and pulled toward the tarsal plate. Three 5-0 absorbable sutures are placed medially, centrally and laterally into the upper one-third to one-half of the tarsal plate to secure the new insertion for the aponeurosis. A new skin fold is created by placing 3–5 6-0 nylon sutures across the wound, incorporating the upper skin wound, aponeurosis, and lower skin wound.

#### *Dermatochalasis*

The degree of upper eyelid skin redundancy is determined after the eyebrow and eyelid are put back in place. We usually remove excess skin during surgery for upper lid ptosis. When dermatochalasis is the only problem, our approach varies depending on the position of the original eyelid crease. The main goals are to create an aesthetically acceptable upper lid crease, simplify the surgical procedure, and minimize postoperative swelling (Figure 4). Care is taken to keep the lid crease and the lower border of eyebrow at least 15 mm apart in order to prevent sagging of the eyebrow.

#### *Procedure for patients with a satisfactory preoperative crease*

The lower incision site is placed approximately 1 mm superior to the upper lid crease in order to preserve the attachment of the aponeurosis to its original insertion. After excess skin is removed, the skin is re-approximated with interrupted 6-0 nylon sutures.

### *Procedure for patients with partially satisfactory preoperative crease*

Where part of the crease is satisfactory, the lower incision is marked 1 mm above it; the remainder of the incision is marked at the desirable new height. A bridle suture with 4-0 silk is placed at the central lid margin, incorporating the skin and part of the tarsus. Matrix sutures using 6-0 nylon are passed through the fornix as the assistant flips the eyelid back and forth with a Desmarre retractor. The sutures exit the subcutaneous tissue right under the lower skin wound, and the knots are tied to create the new lid crease as needed.

### *Procedure for patients who need a reconstructed lid crease*

The lower incision is made at the height of the desired lid crease. After excess skin is removed, the levator aponeurosis is exposed by dissecting the septum. Fat can be removed at this time if necessary. We recommend removing the pretarsal orbicularis muscles in order to minimize post-operative swelling. The lid crease is created by placing 4–6 interrupted 6-0 nylon sutures through the skin of the lower wound, the levator aponeurosis, and the skin of the upper wound.

### *Lower eyelid surgical procedures*

The recommended incision line is at least 2–3 mm from the lower lid margin in order to preserve pretarsal orbicularis muscles and prevent iatrogenic ectropion. When entropion and ectropion accompany a lower lid bag, they are all corrected at the same time. Since the lower eyelid region is anatomically connected with the midface, there is room both below the lid and in the premalar region to allow for repositioning of fat pads into these areas, facilitating the formation of a smooth contour extending beyond the orbital region.

### *Senile entropion and ectropion*

Various methods such as the Quicker-Rathbun technique and lateral tarsus shortening procedures have been described for treatment of senile entropion and ectropion<sup>5,12,26–28</sup>. The Quickert-Rathbun full-thickness rotational suture technique addresses the lower retractors and orbicularis override by using matrix sutures to create connections between the lower fornix and inferior lid margin<sup>29</sup>. Lateral tarsal strip and full-thickness wedge excision of the tarsus correct horizontal lid laxity by shortening the lower lid<sup>28</sup>.

### *Lower lid bag formation and tear-trough deformity*

The lower lid bag can be approached either transcutaneously or transconjunctivally, depending on whether redundant skin is to be removed. Most of our patients have excess lower lid skin and are operated on via a subciliary incision. Standard lower lid blepharoplasty involving fat excision often causes periorbital hollowing as a complication, and there is a high recurrence rate<sup>16</sup>. For that reason, many fat preservation techniques for lower lid blepharoplasty have been described<sup>16,30–35</sup>. Two methods we frequently use are capsulopalpebral fascia hernia repair and lower eyelid bag fat reposition with midface lift.

Capsulopalpebral fascia hernia repair does not require dissection beyond the arcus marginalis and is a good choice if the tear-trough is inconspicuous. However, the surgeon should be aware that, as the patient continues to age, tear-trough deformity and lid-cheek hollowing will become more discernible, and additional fat repositioning may be required<sup>16</sup>. We therefore currently perform lower eyelid fat repositioning with a midface lift as a standard procedure for most of our patients regardless of the condition of the tear-trough. This approach has yielded satisfactory and predictable results.

### *Capsulopalpebral fascia hernia repair<sup>16,36</sup>*

After 2% lidocaine with 1:100,000 epinephrine is administered, a subciliary incision is made. The preseptal orbicularis is dissected away from the fat tissue to the level of the arcus marginalis. The orbital septum is incised, exposing the capsulopalpebral fascia. The inferior portion of the fascia is sutured to the arcus marginalis with interrupted 5-0 absorbable sutures. If the sutures are placed too high on the fascia, downward traction of the lid margin is evident, and the sutures should be repositioned. Gentle pressure on the globe through the upper eyelid exposes excess orbital fat that is not contained by the sutures. This extra fat is removed. The preseptal orbicularis muscle (with skin flap) is secured to the lower portion of the lateral wall with a single 5-0 monofilament suture. The wound margins are approximated with interrupted 6-0 nylon sutures.

### *Orbital fat repositioning with midface lift*

Sensöz et al.<sup>30</sup> first described the technique of septo-orbitoperiostoplasty in 1998, introducing the concept of placing the orbital fat back into the orbital cavity by suturing the orbital septum to the periosteum of the orbital rim<sup>16</sup>. Goldberg<sup>37</sup> designed a modification of this

technique, reaching beyond the arcus marginalis and repositioning the fat pads into the subperiosteal space inferior to orbital rim. With this method, the tear-trough deformity is filled with the herniated fat tissues, achieving an excellent cosmetic outcome<sup>37</sup>. Mohadjer and Holds<sup>38</sup> described a similar technique, placing fat tissue in the intra-suborbicularis oculi fat space, hence called an intra-SOOF procedure. In both of the latter two procedures, the fat pads are temporarily secured externally with matrix sutures through the cheek skin.

We have modified the intra-SOOF approach. Instead of externally fixating the individual fat pads in the cheek skin, we prepare a single fat flap enclosing all three fat pads in the septum and secure it to the midface internally. The internal fixation gives an immediately acceptable postoperative appearance and permits permanent connections between the fat pads and the midface. We concur with Mohadjer and Holds<sup>38</sup> about the procedural and cosmetic advantages of the intra-SOOF approach over the subperiosteal approach. We find the subperiosteal space limited and dissection of the perosteum cumbersome, in contrast to the large supraperiosteal space which is easily identified and accessed. Fat repositioned in the more anteriorly located upper midface region yields a puffier, younger look (Figure 5).

**Surgical procedures.** The degree of skin redundancy is determined by having the patient who is lying supine look up with the mouth open. Subcutaneous anesthesia is administered, and the excess skin and underlying orbicularis muscles are removed. Dissection is carried out between the orbicularis muscles and orbital septum to the level of the arcus marginalis. The fat pads are freed from their attachments to the inferior orbital

wall until they can be stretched 15–20 mm. Additional local anesthesia is injected into the SOOF area. Inferior portions of the periorbital ligaments are released and dissection in the supraperiosteal plane is extended into the upper portion of the cheek approximately 15 mm from the orbital rim to create a space for the fat. The edges of the fat flap are secured to the deep margin of the lifted midfacial tissues with 3–4 interrupted 5-0 non-absorbable sutures. The septum overlying the fat tissues is polished and excess lateral fat tissue is excised through an opening in the septum. The midfacial tissues are grasped slightly above the pre-placed sutures with two teeth forceps and lifted toward the lid margin in an attempt to release some of the downward tension and to lift the midface tissues. The wound is closed with interrupted 6-0 nylon sutures.

## Conclusion

The complex structures of the periorbital region reveal signs of aging more than any other part of the human body. However, with careful surgical techniques, many of the effects of aging around the eyes can be reversed in operations that are acceptable to elderly patients. General anesthesia is not required, so that even patients with underlying disease can tolerate the procedures. Operative times are usually relatively short, and the immediate results are reasonably acceptable cosmetically. Once healing has occurred, the patient can expect both functional and psychosocial benefits. Patients who might benefit from surgery can be counseled that age alone is not a contraindication to the procedure.

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Figure 5. (A) Preoperative photograph of a 62-year-old female who underwent lower lid bag repositioning with midface lift by a transcutaneous approach. (B) Postoperative photograph.



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